Claims

We claim:

1 1. A method for increasing transmit diversity gain in a wireless communication system including a transmitter with a plurality of antennas and a receiver with one 2 3 antenna, comprising: measuring a phase of each of a plurality of signals received by the antenna in 4 5 the receiver; selecting one of the plurality of signals as a reference signal; 6 7 determining, independently for each other signal with respect to the 8 reference signal, feedback information indicating a required rotation of each other signal so that a phase of each other signal is within an identical quadrant as the 9 phase of the reference signal; 10 sending the feedback information for each other signal to the transmitter; 11 12 phase rotating, in the transmitter, each other signal according to the 13 corresponding feedback information to produce a rotated signal; and 14 transmitting the reference signal and each rotated signal to the receiver. 2. The method of claim 1, in which the reference signal is selected randomly from 1 2 the plurality of signals. 1 3. The method of claim 1, further comprising: measuring a power of each of the plurality of signals; and 2 3 selecting a highest power signal as the reference signal.

- 4. The method of claim 1, in which the transmitter has two antennas, and the
- 2 feedback information is one bit.
- 5. The method of claim 4, in which a space encoding vector is $\mathbf{p}_k = [1,(-1)^{b_k}]$, where
- 2 $b_k \in \{0,1\}$ is the feedback information sent from the receiver.
- 1 6. The method of claim 1, in which the transmitter has more than two antennas,
- 2 and the feedback information is two bits for each other signal.
- 1 7. The method of claim 6, in which a space encoding vector is
- 2 $\mathbf{p}_{k} = \begin{bmatrix} 1 & \exp[\frac{i \cdot q_{2}(k)\pi}{2}] & \cdots & \exp[\frac{i \cdot q_{M}(k)\pi}{2}] \end{bmatrix}$, where $i^{2} = -1$, and $q_{m}(k) \in \{0,1,2,3\}$ is the
- 3 feedback information sent from the receiver, for $m = 2, 3, \dots, M$, and $q_1(k) = 0$, for $\forall k$.
- 1 8. The method of claim 1, further comprising:
- 2 normalizing the quadrant to the phase of the reference signal.
- 9. The method of claim 8, in which the phases of the other signals with respect to
- 2 the phase of the reference signal are $\tilde{\theta}_m = \theta_m \theta_1 + 2l\pi$, where an integer l is selected
- 3 such that each normalized phase $\tilde{\theta}_m$ is in a range of $[0,2\pi)$.
- 1 10. The method of claim 1, in which the receiver is a cellular telephone.

1	11. A system for increasing transmit diversity gain in a wireless communication
2	system, comprising:
3	a receiver including one antenna, and further comprising:
4	means for measuring a phase of each of a plurality of signals
5	received by the one antenna;
6	means for selecting one of the plurality of signals as a reference
7	signal;
8	means for determining, independently for each other signal with
9	respect to the reference signal, feedback information indicating a required
10	rotation of each other signal so that a phase of each other signal is within an
11	identical quadrant as the phase of the reference signal; and
12	a transmitter with a plurality of antennas, and further comprising:
13	means for receiving the feedback information;
14	means for phase rotating each other signal according to the
15	corresponding feedback information to produce a rotated signal; and
16	means for transmitting the reference signal and each rotated signal to
17	the receiver.